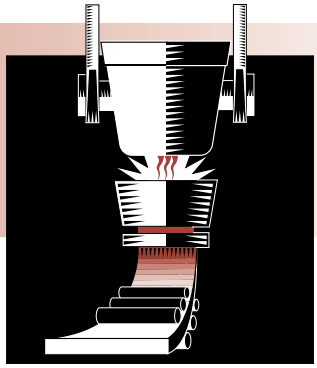
STEEL

Success Story



BETHLEHEM STEEL TECHNOLOGY SHOWCASE

BENEFITS

The Showcase demonstrated steelmaking and processing technology advancements that were accomplished through a number of partnership activities between the U.S. Department of Energy and the steel industry. As part of an outreach program, a large number of outside visitors were given the opportunity to learn more about new technologies.

- Demonstrated technologies will improve energy efficiency and productivity and result in reduced environmental emissions
- Transfer of advanced technologies and concepts to industry
- Opportunity for additional partnerships with end-users, suppliers, equipment manufacturers, national laboratories, and universities

APPLICATIONS

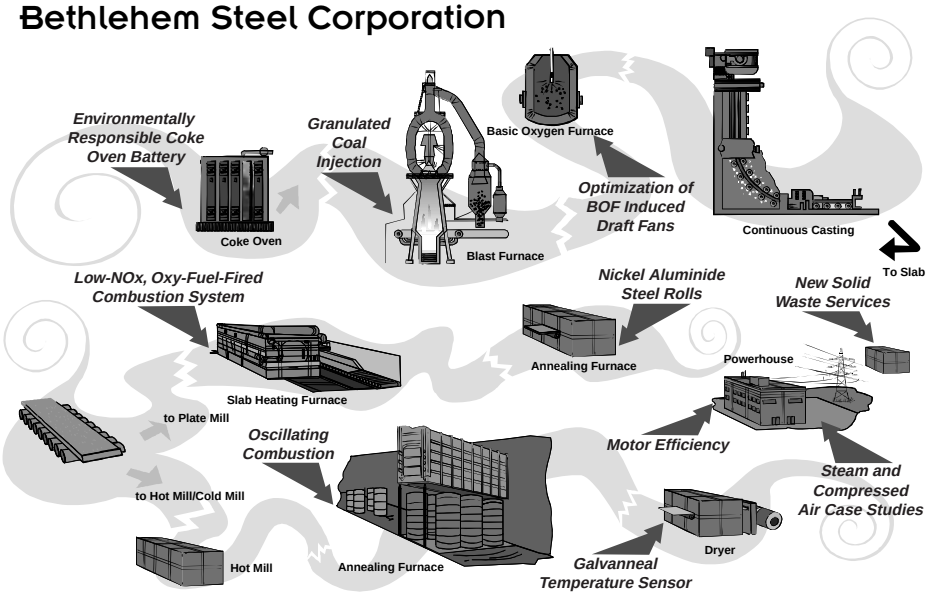
Offering your plant as a Technology Showcase affords the opportunity to demonstrate the latest in technology in your industry that could ultimately improve your productivity, equipment reliability, and safety. The U.S. Department of Energy's Office of Industrial Technologies will cost-share installation and help you collect data to confirm saving and productivity numbers. We will document and publish, as case studies, significant energy savings projects that you have already accomplished. At your request we will provide cost-shared energy assessments of your steam, compressed air, motor, pump, and fan systems. From a public relations standpoint, your company will be able to demonstrate that it is a technology leader in the industry. The Office of Industrial Technologies will support Technology Showcases in the following industries: Steel, Agriculture, Aluminum, Chemical, Forest Products, Glass, Metal Casting, Mining, and Petroleum.

PARTNERSHIP SHOWCASES STEEL TECHNOLOGIES OF TOMORROW

Decision makers from U.S. steel companies and equipment manufacturers attended a technology showcase at Bethlehem Steel's Burns Harbor Division in northwestern Indiana on April 30, 1998. The Burns Harbor Technology Showcase offered steel producers and steel businesses an unusual opportunity to learn about emerging steel technologies that can help save energy, reduce emissions, and increase productivity. Innovative technologies featured in the Showcase were the results of a highly successful cost-shared partnership between the U.S. Department of Energy and the U.S. steel industry. Bethlehem Steel Corporation, which field-tested many of the new technologies, sponsored the showcase to share the results of the Department of Energy's Office of Industrial Technologies' Steel Program.

Bethlehem Steel's flagship steel mill in Burns Harbor was a natural choice for the Showcase since it is one of the most modern integrated mills in the United States. Participants were able to talk with experts about a wide variety of cutting-edge technologies including advanced sensing, advanced materials, efficient motor systems, low-NOx combustion, solid waste reduction, efficient steam and compressed air systems, and air pollution reduction techniques.

Burns Harbor Plant
Bethlehem Steel Corporation



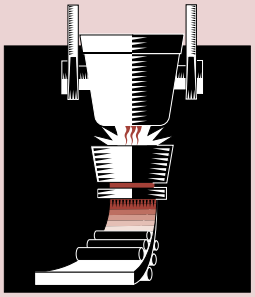
Showcase Description

Goal: To demonstrate industry technology advancements made through the various partnership activities between the Department of Energy and the steel industry and to showcase the achievements and continuing efforts of the Bethlehem Steel Corporation to save energy, reduce pollution, and raise productivity at its Burns Harbor Division.

Technologies Showcased at Burns Harbor

The Burns Harbor staff gave guests technical presentations and provided guided tours of selected sites within the Burns Harbor Division that focused on cutting edge technologies resulting from the various partnership activities between the Department of Energy and the steel industry.

- **Best Practices** -
  - **Optimization of Basic Oxygen Furnace Induced Draft Fans** - By installing a variable frequency drive and making associated equipment modifications in the induced draft fans that remove gases from one of the basic oxygen furnace, the plant was able to better match the fan's speeds to the basic oxygen furnace's varying requirements, which saved energy, reduced operational costs, and decreased system maintenance.
  - **Steam System Advancement** - By rebuilding the turbine to incorporate the latest steam path technology, using a portion of the warm condenser cooling water exhaust stream instead of cool lake water for boiler feedwater make-up, and injecting the low-pressure steam previously used to heat the lake water into the turbine, BSC was able to significantly increase the capacity and efficiency of the steam turbine generator system. This project resulted in annual savings of approximately 40,000 MWh of electricity, 85,000 MMBtu of natural gas, and nearly $3.3 million. The project also reduced high-temperature water discharge into the harbor, and decreased coke oven and blast furnace gas emissions.
- **Galvanneal Temperature Sensor on the Galvanneal Line Dryer** - By installing this sensor at the galvanneal line dryer, process operators are able to improve process performance and throughput. The galvanneal temperature measurement system provides a non-contact, emissivity independent assessment of process temperatures and can be used at a number of locations throughout the mill including at the furnace during annealing or soaking, on continuous casters, during hot rolling as well as at the galvanneal dryer. An estimated energy savings of 130 billion Btus per year can be achieved in galvannealing and galvanizing processes alone through faster setup and more accurate process operation.
- **Nickel Aluminide (Ni_3Al) Steel Rolls in Plate Mill Annealing Furnace** - Intermetallic alloys are a class of materials that have exceptionally high strength and corrosion resistance at elevated temperatures. One of these, Ni_3Al, was prepared by Metallamics, centrifugally cast by Sandusky International, and tested by the Bethlehem Steel Corporation in a reheat furnace at the Burns Harbor, IN mill. Rolls have performed well for nearly two years without significant deterioration. Problems with welding trunnions have been overcome and Bethlehem is planning to install about 60 rolls for large scale evaluation. Oak Ridge National Laboratory is the technical lead for alloy preparation and welding methodology.
- **Oscillating Combustion in Cold Mill Batch Annealing Furnace** - High-temperature, natural gas-fired furnaces used in steel and other industries produce large quantities of NOx per unit of material processed. Regulations on emissions from industrial furnaces are becoming increasingly stringent. In addition, competition is forcing operators to make their furnaces more efficient and productive. Oscillating combustion offers the high temperature material processing industries need for increased efficiency, productivity, and reduced NOx emissions from industrial furnaces whether they are fired with ambient air, preheated air, enriched air, or industrial oxygen. Oscillating combustion is easily retrofitted to existing burners since no modifications to the burner or the furnace are necessary.
- **Oxy-Fuel-Fired Combustion System in Slab Heating Furnace** - Steel reheating is an energy-intensive process that requires uniform temperature distribution within the furnace. The goal of the program is to demonstrate the economic, environmental, and quality benefits of an advanced oxy-fuel-fired combustion system for a continuous slab reheat furnace. Praxair intends to market this technology first to its existing customer base which represents about 50% of the integrated and 40% of the electric arc furnace market segments.
- **Power Line Damage, Electrical Outages, Reduced in the "Sleet Belt"** - With assistance from the Inventions and Innovation Program, AR Products developed the AR Windamper System, an aerodynamic device clamped to high-voltage overhead transmission line to overcome galloping. The system introduces a positive damping force by twisting the conductor to cancel the aerodynamic lift that clinging ice and snow cause.



Showcase Attendees

The one-day intense educational and public relations effort of the Showcase involved many organizations. Types of organizations and participants included:

- Equipment/technology decision makers representing all U.S. steel manufacturing and major supplier companies
- State of Indiana and other local officials
- Technology experts from the Universities, the National Laboratory system, and industry suppliers
- Representatives from the media
- Federal government agencies and the public

For additional information, please contact:

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April 2000